

HIGH ANDEAN PRONOPHILINI FROM VENEZUELA:
TWO NEW SPECIES OF *DIAPHANOS*
(NYMPHALIDAE: SATYRINAE)

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Abstract. *Diaphanos fuscus*, new species, and *D. curvignathos*, new species, are described and illustrated from the Cendé and Niquitao areas, respectively, in the States of Lara and Trujillo in the Andes of Venezuela. The two new species are compared with the type-species of the genus, *D. huberi*, which is known from the Cordillera de Mérida. A key for separating the three species is presented. Comments on the biology, habitat, and distribution of the new taxa are presented.

Additional key words: *Diaphanos fuscus*, *D. curvignathos*, *D. huberi*, endemic species, páramo.

The montane butterfly fauna of northern South America is exceptionally diverse, especially the Satyrinae, which contains many endemic elements. Within the subfamily, the genera *Paramo*, *Dangond*, *Redonda*, and *Diaphanos* are considered "relicts" (Adams & Bernard 1981, Adams 1985); they are restricted to high altitudes in the isolated páramos of the Sierra Nevada de Santa Marta (Colombia), Sierra de Perijá (Colombia-Venezuela), and Cordillera de Mérida in Venezuela.

Adams and Bernard (1981) described the genera *Redonda* and *Diaphanos* from the highlands of the Mérida range, believing both to be monobasic. *Diaphanos huberi* Adams and Bernard is the most unusual satyrid of the tribe Pronophilini because of its small size, coloration (almost transparent), and other peculiar morphological features.

During an inspection of the butterfly collection at the Museo del Instituto de Zoología Agrícola of the Universidad Central de Venezuela, I found a single worn male of a dark *Diaphanos* from Páramo del Jabón, Lara State, which was distinct from *D. huberi*. This led me to visit Fila de Los Nepes (near Páramo del Jabón) in August 1991, where I observed the butterfly in its natural habitat and collected additional specimens. Subsequently, J. Camacho of the Universidad del Zulia (MALUZ) showed me similar specimens from Páramo de Las Rosas, south of Los Nepes and nearer El Jabón, a place where this species is locally common. It became apparent that all these specimens represented an undescribed taxon. I was interested in establishing the western distributional limit of this new *Diaphanos*, and during additional field work, I collected the genus in the Páramo de Ortiz, Trujillo State. The latter specimens are smaller in size and lighter in color. The genitalia are distinct, indicating that the specimens from Trujillo represent an additional undescribed species. In this paper I describe these two new

species and present life history observations. A key to the species based on wing coloration and distribution also is presented.

Disposition of material. The holotypes and most of the paratypes are deposited in the Museo de Artrópodos de la Facultad de Agronomía of La Universidad del Zulia (MALUZ) and in the Museo de Biología de La Universidad del Zulia (MBLUZ), both in Maracaibo, Venezuela. Representative paratypes are deposited in the Museo del Instituto de Zoología Agrícola de la Universidad Central de Venezuela, Maracay (MIZA); The Natural History Museum, London, England (BMNH); and the private collection of Tomasz Pyrcz, Warsaw, Poland (TPP).

SYSTEMATICS

Key to the Species of *Diaphanos* in the Venezuelan Andes

1. Wings translucent, Mérida range *D. huberi*
Wings not translucent; dorsally fuscous or dark brown 2
2. Hindwing underside with one cream-white streak in cell A_2 (Cendé range)
..... *D. fuscus*, n. sp.
Hindwing underside with two cream-white streaks in cell A_2 (Niquitao range)
..... *D. curvignathos*, n. sp.

Diaphanos fuscus Viloría, new species

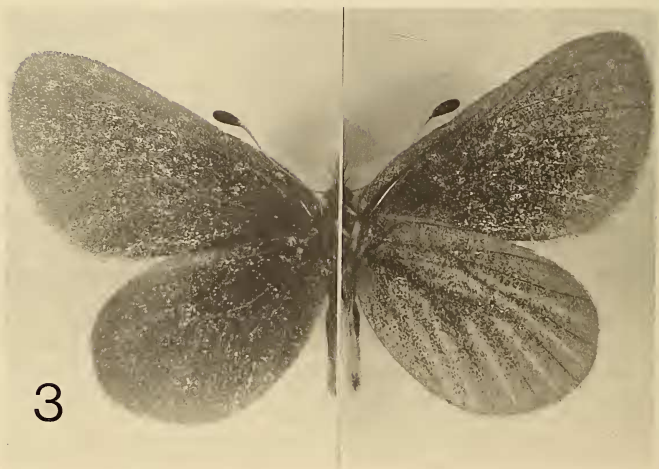
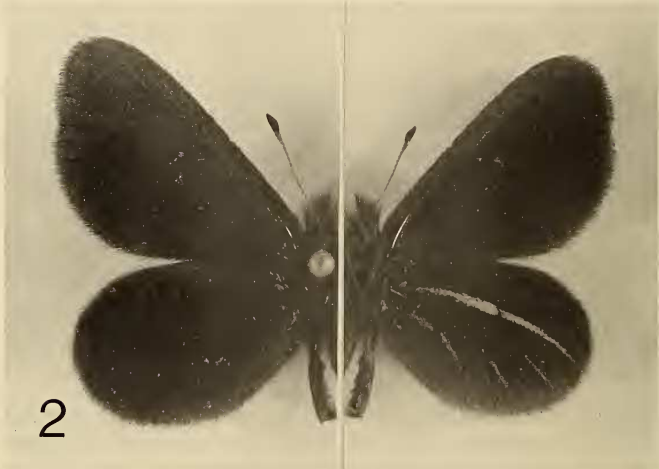
(Figs. 1, 2, 4, 6)

Description. Eyes glabrous, dark brown, circled with reddish brown. Palpus twice as long as head, chestnut brown with dark fuscous hairs. Antenna to 0.40 length of costa; shaft orange-brown, sparsely scaled; club black, tapered (not as blunt as in *D. huberi*), 2.5 to 3.0 times longer than broad, concave, comprising eleven segments. Wing venation as in *D. huberi*. Forewing tornus obtuse. Both wings rounded; dorsal surface covered with spindlelike scales that are dentate distally, broader distally (triangular shaped) in females. Marginal scales spinelike, each dentate at distal extreme; scales longer in female (Fig. 6).

Male. Forewing length 17–21 mm ($n = 23$) (Fig. 1). Body dark fuscous, tip of abdomen lighter. Upperside ground color of wings dark fuscous, glossy, slightly lighter towards outer margins. Dorsal surface of wings hairy; hairs longer and more abundant in basal half, especially on hindwings. Underside ground color as on upperside, but lighter and more opaque. Hindwing underside with spindlelike cream-white streak parallel to veins, extending through discal cell and M_3 from base to near outer margin, interrupted by M_2 – M_3 ; a series of narrow cream-white streaks parallel to the veins, from near discal cell to near outer margin, in cells Cu_1 , Cu_2 , and A_2 . Ventral surface of wing densely hairy. Genitalia as in Fig. 4.

Female. Forewing length 16–19 mm ($n = 8$) (Fig. 2). Dorsal surface of body dark fuscous, ventral surface brown. Wings slightly narrower and forewing apex sharper than in male. Scales and hairs on both wing surfaces less dense than in male. Upperside ground color fuscous, darker at base, dusted with brown scales mainly in distal half of both wings. Underside ground color light brown, with golden sheen, dusted throughout with fuscous scales, more dense in basal one-third of both wings. Forewing underside with series of narrow and vestigial white streaks parallel to veins, from discal area to outer margin, in cells M_1 to Cu_2 ; cell A_2 dusted with white scales near tornus. Hindwing underside with series of white streaks as in male, but less distinct.

Variation. Wing maculation is variable in males. In a few specimens the forewing upperside is dusted with gray scales in the discal and postdiscal areas. The ground of



both the upper and underside may be olivaceous or brownish. In some individuals the distal one-fourth of the fore- and hindwing undersides have a chestnut tone. All streaks on the hindwing underside are highly variable. They may reach the outer margin or not; sometimes only vestigial streaks are present (except for the longer spindlelike one which is always well defined). The most strikingly marked individuals have an additional streak in cell M_2 and a speckling of cream-white scales near the streak in A_2 .

Variation among females is apparent on the underside of the wings where the ground color may be as light as cream-white. In this case it is difficult to distinguish the white streaks on both wings, except for the longer spindlelike streak of the hindwing. The most heavily marked individuals have additional narrow streaks in cell M_2 and A_3 .

Types. Holotype: male, Fila de Los Nepes, Páramo de Los Nepes, 2550 m, Lara State, Venezuela (9°45'N, 70°04'W), 12 Aug. 1991, A. Viloría & J. Camacho (MALUZ). Paratypes: 22 males, 8 females as follows: VENEZUELA: Lara State: 3 males, 4 females, same data as holotype (MALUZ); 1 male, Páramo del Jabón (9°30'N, 70°06'W), 3000 m, 20 Feb. 1985, CEUM (MIZA); 18 males, 4 females, Páramo de Las Rosas, Municipio Morán (9°36'N, 70°07'W), 3150 m, 20 Aug. 1991, J. Camacho (MIZA, BMNH, TPP, MALUZ).

Etymology. The name *fuscus* refers to the dark coloration of this species.

Comments on the Natural History. *Diaphanos fuscus* is locally common in the páramos of Los Nepes, Las Rosas, and El Jabón, all of which belong to the massif of El Cendé (Fig. 7). El Cendé is considered one of the most isolated páramo units of the Venezuelan Andes (Simpson 1971, Vuilleumier 1979). The species probably is restricted to this páramo unit which includes the states of Lara and Trujillo.

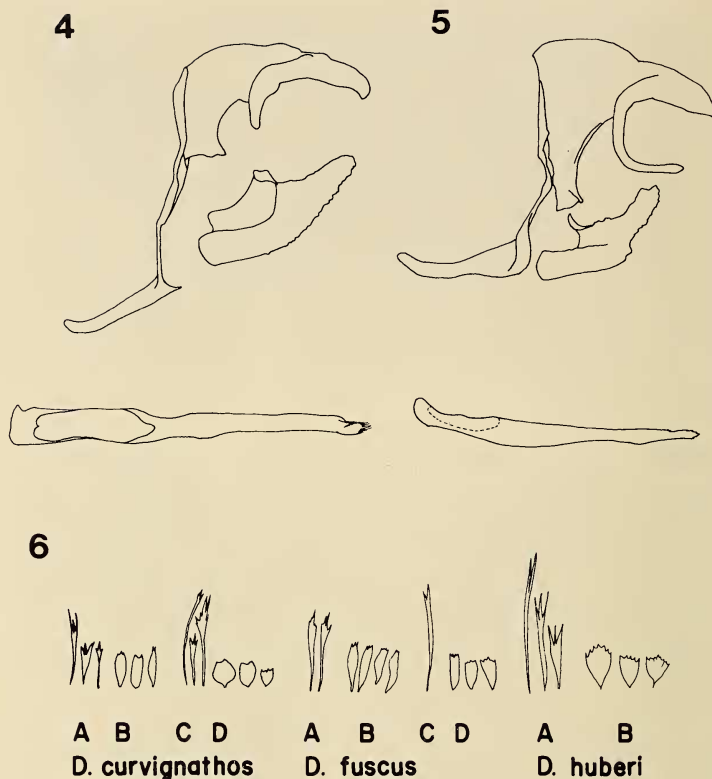
Northeastern slopes of the Cendé range (the Los Nepes area) are relatively arid; consequently, the páramo vegetation—with characteristic speletine composites—is developed from 2400 m, although there are some forest patches near La Fila (2500 m). *Diaphanos fuscus* flies only in páramo habitat and has been collected from 2550 to 3150 m.

During a visit to Los Nepes in August 1991, the weather was mostly windy and foggy. No butterflies were seen until the clouds cleared between 1140 and 1330 h. All individuals observed and collected were from a small open area surrounded by low shrubs (1.5 m tall) of *Libanothamnus* (Asteraceae). The butterflies flew weakly, close to the grasses and over the shrubs, and never more than 2 m above the ground.

A single female was observed resting and displaying on the flowering spike of a "palmiche" (*Orthosanthus chimboracensis* Bak., Iridaceae) in a supposed thermoregulatory posture exhibited by other páramo butterflies (Descimon 1986, Viloría unpublished). Two other females

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FIGS. 1–3. Upperside (left) and underside (right) of *Diaphanos* species. 1, *D. fuscus*, n. sp., female, same data as holotype; 2, *D. fuscus*, n. sp., holotype, male, Fila de Los Nepes, Páramo de Los Nepes, Lara State, Venezuela; 3, *D. curvignathos*, n. sp., holotype, male, Páramos de Ortiz, Trujillo State, Venezuela.



FIGS. 4-6. Male genitalia and wing scales of *Diaphanos* species. 4, Male genitalia of *D. fuscus*; 5, Male genitalia of *D. curvignathos*; 6A, Marginal scales in male; 6B, Dominant scales on wing surface of males; 6C, Marginal scales in females; 6D, Dominant scales on wing surface of females.

flew from some palmiches when these plants were disturbed. Three females from Los Nepes remained alive for at least 30 hours following their capture. Each oviposited 4 to 15 eggs inside paper envelopes without attaching them to any surface. The most prolific female died still containing many eggs in its abdomen.

The egg (Fig. 8) is spherical (1.0 mm in diameter), pale green, smooth, and free of cement or glue. Examples are deposited in MBLUZ.

It is interesting that some females of *Redonda* from Páramo de Ortiz (Trujillo) had a similar but more violent oviposition behavior, releasing large numbers of eggs into paper envelopes immediately after their capture (Viloria personal observation). This may be an instinctive response to the stress of capture and handling. It also suggests that these butterflies may not place their eggs directly on the host, but may

broadcast them. Non-plant oviposition substrates have been reported previously for butterflies by Chew and Robbins (1984). In addition, DeVries (1987) reported that some Neotropical satyrid species expel their eggs while flying, so that eggs are dispersed over the plants or among the grasses on the ground, and this may be the case in *D. fuscus*.

As for all Pronophilini, it is believed that a bambusoid grass is the host plant of *Diaphanos fuscus*. In my experience, bamboos are scarce in Los Nepes (but much more common in Las Rosas), and they grow mainly in the herbaceous strata under *Libanothamnus* shrubs. The only bamboo species recorded from Los Nepes is *Rhipidocladum geminatum* (McClure) (Clark & Londoño 1991), but other species occur within the Cendé massif [e.g., Clarke (1989) reported *Chusquea angustifolia* (Soderstrom & C. Calderón) in Las Rosas]. Other dominant plant species in the highlands of Cendé are the grasses *Agrostis* and *Calamagrostis* (Poaceae) and the composites *Espeletia*, *Espeletiopsis*, *Ruilopezia*, and *Hinterhubera* (Asteraceae) (Vareschi 1970, Cuatrecasas 1979). The only pronophiline butterfly recorded in association with *D. fuscus* is an undescribed species of *Redonda* (Viloria & Pyrcz unpublished).

Diaphanos curvignathos Viloria, new species

(Figs. 3, 5, 6)

Description. Eyes glabrous, dark brown. Palpus twice as long as head, light brown, with fuscous and chestnut hairs. Antenna to 0.4 length of costa; shaft orange-brown, almost without scales; club black, slightly more gradual than in *D. fuscus*, three times longer than broad, concave, comprising eleven segments. Venation similar to other species of *Diaphanos*. Forewing tornus obtuse; both wings rounded. Most of dorsal surface covered with suboval scales, longer on hindwing, broader and rounded in females. Some lighter, spindlelike scales, like those of *D. fuscus* male, dusted over entire wing surface. Marginal scales spinelike, dentate distally; longer in female (Fig. 6).

Male. Forewing length 14–17 mm ($n = 11$) (Fig. 3). Body dark fuscous, slightly lighter on distal and ventral regions of abdomen. Upperside ground color of wings dark brown, glossy, lighter and reddish from distal region to outer margins. Dorsal surface of wings hairy; hairs longer and most abundant in basal one-half and anal region, especially long on hindwing. Basal one-half of forewing underside fuscous, becoming light brown in distal one-half. Hindwing underside light brown, becoming fuscous towards base and center of wing. Discal cell almost entirely cream-white; a series of narrow cream-white streaks parallel to veins, from discal cell to outer margin, in cells M_2 to A_2 (two streaks in latter). Ventral surface of wings densely hairy. Genitalia as in Fig. 5.

Female. Forewing length 16 mm ($n = 1$). Essentially as described for male.

Variation. Variation among the specimens studied is slight. In some males the upperside ground color of the distal two-thirds of the wings is ochereous rather than reddish, and the cream-white scales in the discal area and streaks on the hindwing underside are pale yellow. In darker individuals, the streaks are reduced but still distinct. In lighter individuals, there are cream-white scales in the costal region of the hindwing underside.

Types. Holotype: male, Páramo de Ortiz, 2850–3100 m, Trujillo State, Venezuela (9°13'N, 70°24'W), 12 Sept. 1991, A. Viloria & E. Moscó (MBLUZ). Paratypes: 10 males, 1 female as follows: VENEZUELA: Trujillo State: 5 males, same data as holotype (BMNH, MBLUZ, TPP); 5 males, 1 female, Paramo de Ortiz, 2900–3000 m, 7 Jan. 1992, A. Viloria & J. Camacho (MALUZ).

Etymology. The specific epithet *curvignathos* is a composite of the Latin *curvus* (=

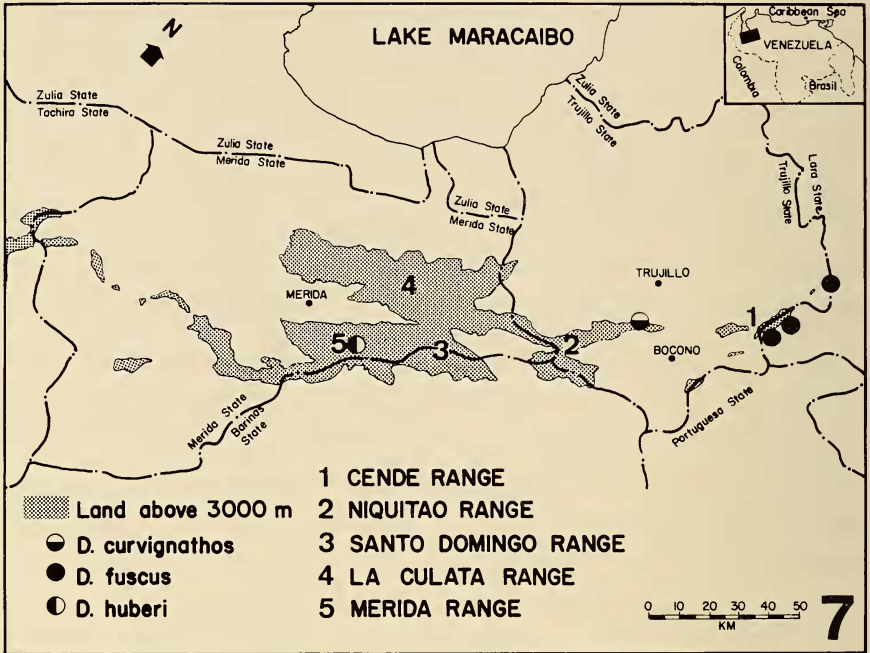


FIG. 7. Geographical distribution of the Venezuelan highlands and distribution of the three species of *Diaphanos*.

curved) and the Greek *gnathos* (= mandible, also the name of the subuncal structure in the male genitalia), alluding to the hooked subunci of this species.

Comments on distribution and biology. *Diaphanos curvignathos* occurs locally in Páramo de Ortiz, but is rare. It is possible that its distribution includes all of the páramos connected to the Niquitao massif, one of which is Ortiz. The latter range contains the highest mountains of Trujillo State, reaching 4006 m at Cerro La Teta.

Because of the orographic connection between the Mérida and Niquitao mountains and the fact that *D. huberi* ranges between 3400 and 4000 m in Mérida, it is possible that *D. curvignathos* and *D. huberi* are parapatric in the Niquitao range. However, *D. huberi* has been recorded only in the Cordillera de Mérida, and *D. curvignathos* is unknown from that range.

Owing to the reduced area of páramo above 3400 m in Niquitao, it is unlikely that any other species of *Diaphanos* occupies the uppermost level of these mountains, but further exploration is required.

All specimens but one, which was collected on my first visit to Páramo de Ortiz, were collected within a few minutes at midday, flying over

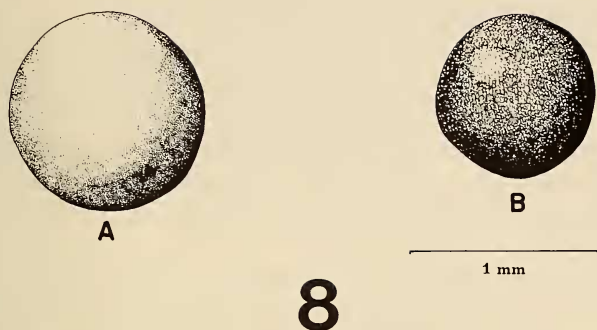


FIG. 8. Eggs of *Diaphanos* species. A, *D. fuscus*, B, *D. curvignathos*.

a small area of grasses in a bend in the road from Trujillo to Boconó. This visit was during the wet season and many plants, especially composites, were in flower. During a second visit in January (dry season), it was sunny but adult butterflies were rare. The butterflies were flying over the grasses and resting on the ground. The only female was taken resting on the dirt road at 1630 h, and it expelled one egg immediately upon capture. The egg (Fig. 8) was spherical (0.8 mm in diameter), pale green, vertically ribbed, and free of cement or glue. It is preserved and deposited in MBLUZ.

Diaphanos curvignathos has a relatively slow flight. It occurs only in páramo habitat between 2850 and 3100 m. The potential foodplant is an undetermined bamboo species (probably *Chusquea*) which is locally abundant in Páramo de Ortiz, especially near streams.

Other satyrids associated with *D. curvignathos* in Ortiz are *Altopedaliodes albonotata* (Godman) and an undescribed form of *Redonda empetrus*, all of which are sympatric.

DISCUSSION

There is sufficient evidence to conclude that *Diaphanos huberi*, *D. fuscus*, and *D. curvignathos* are three distinct species rather than subspecies. They differ in size, coloration, and genital structure. In general, *D. fuscus* is the largest and *D. huberi* the smallest. Differences in wing color patterns allow separation of the species following the key.

Diaphanos fuscus and *D. curvignathos* are most similar in external appearance, but genitalia suggest a closer relationship between *D. curvignathos* and *D. huberi*, both of which have well developed subunci. In contrast, the subuncus of *D. fuscus* is atrophied. *Diaphanos huberi* has a shorter saccus than the other two species. The valvae and aedeagus

are distinct in all three taxa, as are the shape of the wing scales (Fig. 6).

Apparently, each species is restricted to a small area of páramo, which may be the result of orographic and geographic isolation (Fig. 7). *Diaphanos fuscus* lives in the Cendé region whose páramos are quite isolated from the others in Venezuela. *Diaphanos curvignathos* lives in the highlands of Niquitao which are connected to those of the Cordillera de Mérida where *D. huberi* lives.

Diaphanos huberi has not been found in Niquitao, nor *D. curvignathos* in Mérida. Therefore, it appears that there are other ecological factors limiting their distributions. Although these two species inhabit only open lands of the páramos, *D. huberi* is restricted to the uppermost level between 3600 and 4000 m.

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